ORDER DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

7910.1

4/2/74

SUBJ: AERONAUTICAL VIDEO MAP PROGRAM

1. PURPOSE. This order establishes procedures for the preparation and procurement of video maps for solid-state multichannel and/or tube-type mappers for use in radar equipped FAA air traffic control facilities.

2. DISTRIBUTION. This order is distributed to Air Traffic and Airway Facilities branches and above in Washington and Regional Headquarters; overseas area offices; FAA Academy; Aviation Facilities and Air Traffic Systems Divisions at the National Aviation Facilities Experimental Center; Airport Traffic Control Towers; Air Route Traffic Control Centers; RAPCONs; RATCCs; and Airway Facilities Sectors.

3. CANCELLATION. Order OA 7910.1 dated April 28, 1964, is cancelled.

4. BACKGROUND. With the purchase of solid-state multichannel mappers, the Flight Services Division, AAT-400, became responsible for the coordination, development, and procurement of the miniature video map slides, with liaison between Airway Facilities Service, AAF-340, air traffic facilities, and the National Ocean Survey (NOS). AAT-400 and AAF-300 have developed the standards in this order to aid personnel in better use of equipment to minimize preventive maintenance for single- and multiple-channel video mappers. The solid-state multichannel mappers, with cassette-type slides of various scales and ranges, require accurate centering of data, standardization of map scales, symbology and line-weights. New methods, techniques, and new materials have been employed to develop and produce the small map slide, as well as video plates for the tube-type mappers.

5. FIVE-CHANNEL VIDEO MAPPERS. The video mapsdepicted on radar displays are entirely specified by the air traffic control facility. As such, the video map should present an accurate, stable representation of the airways, fixes, boundaries, runway extension lines, etc., to meet the individual unique requirements of each facility. However, the capabilities and limitations of the video mapper equipment must be known and considered when ordering video map slides. This will assure better utilization of the available capabilities and prevent overtaxing the system by, unknowingly, requiring it to perform outside the design parameters. There are three types of five-channel mapper equipment: FA-8049, AN/GPA-131 and the new FA-8970. Although these units are fundamentally similar, they have individual differences. The following information is presented primarily for the new mappers.

a. FA-8970 Video Mapper Capabilities. There are five maps available to each control position. The controller can select one of the five maps or he can overlay one map on top of the other until all five video maps are displayed, When overlaying is used, the minimum planned position indicator (PPI) range must be held to three-fourths of the map slide range (scale); i.e., 40 NM to 30 NM. To change maps, one must be switched off and another switched on (press two switch buttons). No other radar positions will be affected unless more than one display is connected to a BRITE or RBDE unit. The number of radar positions that can be provided discrete map data with full selection capability is 11 (12 positions, 1 reserved for maintenance).

b. Standard Map Ranges. In order to standardize the map-making process and to maintain compatibility with the mapper alignment slides, the following map slide ranges must be used:

Terminal - 10,, 20,, 30,, 40,, 50,, 60 nautical miles.

Enroute - 100,, 125,, 150,, 200,, or any of the above, nautical miles.

Each map channel can be aligned by maintenance personnel to any of the standard map slide ranges. A map channel does not have instantaneous range switching. A realignment is required to change ranges on each individual map channel; also, a new map slide drawn to the desired range scale must replace existing map slide.

c. Video Mapper Accuracy of 1%.

(1) The United States Standard Flight Inspection Manual, OA P 8200.1,, requires that an aircraft reported as being over a fix will be within a circular area about the fix, the radius of which is 3% of the fix-to-station distance, or 500 feet, whichever is greater. Also, the surveillance approach course line will coincide as nearly as practicable with the runway centerline extended. Maximum error left or right of runway edges will not exceed 500 feet, or 3 percent of the distance between the radar antenna and the point at which the approach is discontinued, whichever is greater.

(2) Video mapper accuracy of 1% can only be assured when using a PPI range equal to the video map slide maximum range. If a portion of the map range is viewed on a PPI,, the map accuracy will be reduced accordingly. For instance, if a PPI range of 30 miles is used with a 60-mile map range, the map accuracy will be reduced to 2 percent. This does not leave much leeway for other radar system inaccuracies. Any minor map drift or instabilities are overemphasized when using less than 50% of the map slide range.

(3) Map slide ranges are to be selected and ordered so that no radar display must use less than one--half the map slide range. When overlaying is used, the minimum PPI range must be held to three-fourths of the map slide range (scale).

d. Utilization of a Five-Channel Mapper. Since each air traffic control facility has its own unique requirements, best utilization can only be determined and implemented by those who know and understand those requirements. However, the following examples are offered as guidance as to what can be done:

(1) Terminals with Various Operating Procedures. Terminal facility provides departure and arrival control from separate PPI positions using the same radar range of 40 miles. Surveillance (PPI) approaches are provided using the 10-mile range, occasionally switching to the 6-mile range from a third radar position. The tower cab uses a BRITE display on the lo-mile range.

(a) With a five-channel mapper, the following map slide ranges can be set up:

Map Channel	Slide Range	Function
1	10 N. Miles	Main
2	10 N. Miles	Spare
3	40 N. Miles	Departure
4	40 N. Miles	Arrival
5	40 N. Miles	Composite (Spare)

If approach and departure functions are occasionally combined on one PPI, Map 5 can be used or Map 3 and Map 4 can be selected for combined display.

(b) If PPI approaches are not provided, one 20-mile map slide might be sufficient for the tower cab - and Map Channel 2 can be released for some other function.

Map Channel	Slide Range	Function
1	20 N. Miles	BRITE
2	40 N. Miles	East Main
3	40 N. Miles	East Spare
4	50 N. Miles	West Main
5	50 N. Miles	West Spare

(c) With single-channel video mappers only, one video map plate could be used. A map plate, of required range, is prepared with all data required for all operational functions.

(2) Enroute Facility with High and Low Altitude Procedures. Standard usage of video mappers is to provide four video map channels. These channels were set up and aligned to provide a high map and a low map input to each scan converter. Upon map failure, a spare high or low map is switched in. The following ranges can be applied using one five-channel mapper:

(a) Discrete map video and selection capability can be cabled to up to 10 operational scan converters plus one discrete output to a spare scan converter patch panel. The map video would be on only one scan converter input and any one or all five maps could be selected. Map channels could be set up as follows:

Map Channel	Slide Range	Function
1	200 Mile	High Altitude Main
2	200 Mile	High Altitude Spare
3	125 Mile	Low Altitude Main
4	125 Mile	Low Altitude Spare
5	200 Mile	Special Use

(b) The five-channel mapper can be wired to function, as far as the control position is concerned, exactly in the same manner as the older systems. High map, main or spare, will be on scan converter Map No. 1 input and the low altitude map, main or spare, will be on the No. 2 scan converter input. In this configuration, the fifth map channel would be of no benefit. One discrete position amplifier could be used for high altitude maps (main or spare) and one could provide low altitude maps (main or spare).

6. VIDEO MAPS. All video map slides for multichannel mappers will be acquired through AAT-400, who will coordinate the initial requirements and scheduling with the contractor. After the initial scheduling, facilities will coordinate routine map data changes directly with the contractor. Video map plates for other than multichannel mappers (tube-type) may be obtained by coordinating requests in the above manner. AAT-400 will contract for the procurement of new map slides and plates and revision service, as required. Coordinate requests for special maps or services through AAT-400. Obsolete map holders, associated with FA-8049 (TI) solid-state multichannel mappers must be promptly returned to the contractor, NOS or AAT-420.

a. Responsibility.

(1) Map data to be shown on each individual map is the responsibility of the facility chief, consistent with facility operational requirements.

(2) Airway Facilities Service (Maintenance) shall determine alignment data to be displayed on the map for proper alignment and adjustment of equipment,

(3) After an air traffic facility and its regional office have agreed that computerized video maps will replace those obtained from local sources, the facility shall submit their new map requirements to AAT-400. AAT-400 will ensure requirements are satisfied to meet new radar map standards for increased accuracy and better compatibility of data.

b. Map Standardization. Technological advances and improved techniques have generated requirements for map standardization, which have resulted in a computerized map accuracy of ±.001 inch overall and data portrayed at .002 inch on final product.

(1) Scales. Map scales are standardized for computer plotting on Lambert Conformal Conic Projection at the following compilation scales: terminal maps up to 60 nautical mile range at 1:250,000, for multichannel equipment this may vary, depending on range; Enroute Low Altitude 100-150 nautical miles range at 1:750,000; Enroute High Altitude 200-250 nautical miles range at 1:1,000,000.

(2) Symbology. All map data symbols will be in accordance with the standard symbology (Appendix 1) for depiction on FAA ATC radar video maps. These symbols were developed and adapted as standards. This was necessary for computer-produced maps, training air traffic controllers and cartographers, and improved map production capability. It is recognized that there may be a requirement for map symbols to portray special criteria not reflected in these standards. All recommendations for additions or changes should be submitted to AAT-400 for approval.

(3) Lineweights. Standardization is required to give uniformity for controlling proper lineweights and compatibility of data between radar systems. Lineweights must be applicable at compilation scales for final photographic reductions to .003" lineweights for video plates (tube-type), and .002" lineweights for multichannel video slides.

c. Request for Aeronautical Video Map Plate/Slide/Overlay (FAA Form 7910-1) - Appendix 2. FAA Form 7910-1 has been developed for convenience in submitting proper data. This will include all data required to meet the guidelines in Order 7210.3B, paragraphs 780, 786, 1475 and 1482. Additional procedural sketches, lettersof agreement and supplemental data are helpful in preparing the video map. Air route traffic control centers need only one request form containing composite data for each altitude stratum. Data within radar overlaps, not required on all maps, should be identified for the appropriate map(s). FAA Form 7910-1 will be available on or about March 4, 1974. An initial distribution will be made to radar-equipped facilities and regions. Forms will be stocked in the FAA Depot and will be available through normal supply channels, FSN 0052-841-0000, unit of issue: set. Two additional (three in all) copies of Page 1 have been included in each set to provide one copy for submission to AAT-420 and one copy for subsequent use when utilizing portions of set for revisions.

(1) New Maps. Facilities submitting their video map requirements should forward the standard request form, sketches of video map (not necessarily to scale) for reference, tower/center letters of agreement, or special procedural data.

(2) Revised Maps. Revisions or changes to maps can be made using the standard form, identifying the items being changed by referring to the paragraph grouping under which it appeared in the original request. Include a paper print of the map indicating the changes marked in red for additions and blue for deletions.

(3) Radar Overlays. Facilities requesting radar overlays should use the standard request form, after approval by their regional office. The reliability of the new video mapping system has virtually eliminated the need for map overlays. Those facilities having backup video-mapping capabilities must have regional approval for new or replacement overlays.

(4) Time for Obtaining Maps, Plates and Slides. Facilities are urged to allow sufficient time in planning for and ordering video maps. Twelve weeks from date of receipt of data is required for the initial map and three weeks for revisions. In cases of emergencies, when time is critical, coordinate the request through AAT-400.

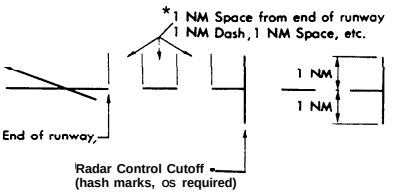
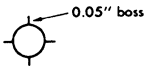
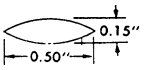
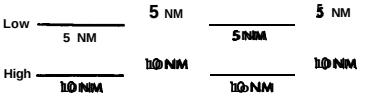
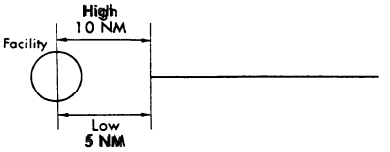
William M. Flener

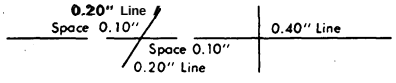
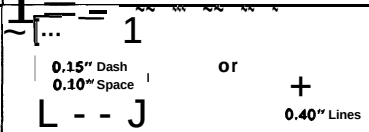
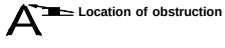
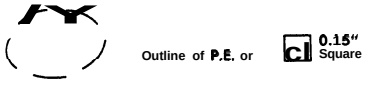
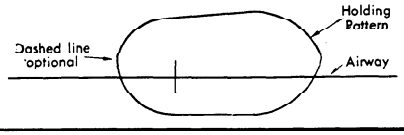
WILLIAM M. FLENER
Acting Associate Administrator for Operations

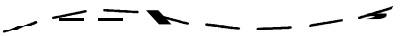
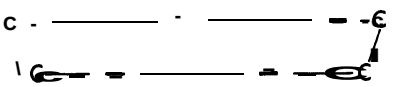
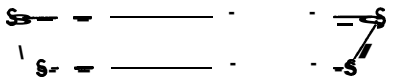
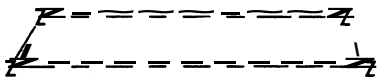
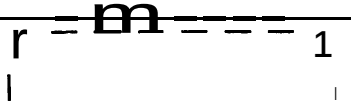
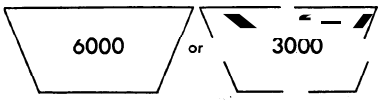
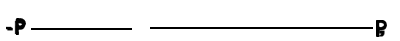
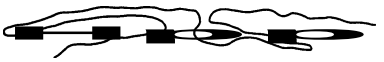
APPENDIX 1. STANDARD SYMBOLS - FAA ATC RADAR VIDEO PLATES (AVPS)

STANDARD SYMBOLS FAA ATC RADAR VIDEO PLATES (AVPS)

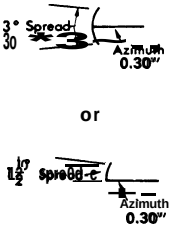
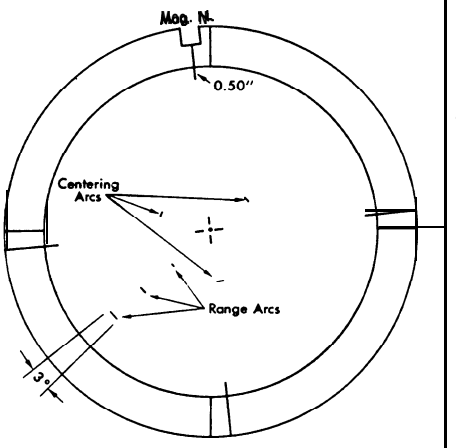
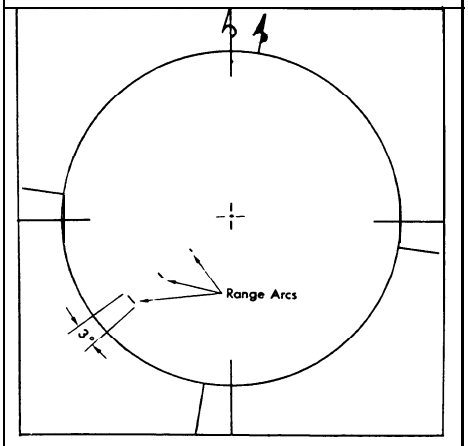
All map data symbols are in accordance with standard symbology for video map plates or slides used in ATC Terminal and/or Enroute facilities. They are shown at compilation size for standardized bases and are proportioned for finished plates or slides.

AERONAUTICAL OR TOPOGRAPHICAL MAP INFORMATION	SYMBOL OR MARK	DETAILED DESCRIPTION
Airports with extended runway centerline/s, as required, shall be portrayed by distinctive runway pattern.		Usable runway/s and centerline/s drawn to scale. Extend runway centerline/s where appropriate out to 10 NM from approach end of runway. *Dashes are 1 NM long and first dash starts 1 NM from end of runway. Spaces between dashes are 1 NM long. Place 2 NM long hash marks as shown perpendicular to extended centerline/s at the proper distances to mark the final approach course intercept and the radar control cutoff point, except when a fix or navaid is located at the points. * ½ NM for Terminal maps.
Airport - by distinctive runway pattern.		To scale
This symbol shall be used for all minor airports.		Circle 0.20" diameter.
Navigational Aids and Fixes: Omni-Directional VOR, VORTAC, TACAN and Radio Beacon	0	Circle 0.30" diameter
Fan Marker		
Airways - Primary		Dashed lines for primary when both high and low altitude airways are depicted. LOW-5 NM dash, 5 NM space. HIGH-10 NM dash, 10 NM space.
Secondary		Solid lines for primary when both high and low altitude airways are depicted.

AERONAUTICAL OR TOPOGRAPHICAL MAP INFORMATION	SYMBOL OR MARK	DETAILED DESCRIPTION
Intersection of Airway and/or Navaid Courses (or Bearings) or Handoff Point		Airway Intersection-Line either side of airway 0.20" long. Aligned to indicate formation. Handoff Point-(DME) Line either side of airway 0.20" long.
Off airway intersection or handoff point.		Lines 0.40" long aligned to indicate formation.
RNAV – Waypoint		Standard charting symbol
Radar Handoff Area *or* Point (for Terminal Area Approach or Departure or Enroute Handoff).		
Radar Antenna Site - Principal		Center dot with 4 - 0.20" legs, 0.10" clearance for dot aligned at cardinal radials of compass (0° 90° 180° & 270° Mag. for Terminal; True for Enroute).
Radar Antenna Site - Other		Dot 0.040" diameter.
Fixed obstruction that is potential hazard to aircraft such as a tower, building, mountain peak, etc.		Inverted V (caret) having legs spread 0.20" at the base with 60° spread. The apex of the caret represents the highest point of the obstruction.
Terrain feature-permanent echo (P.E.)		An area constituting a hazard to aviation shall be outlined by a short dashed line: dash 0.20", space 0.10".
Visual checkpoint		
Holding Patterns		Drawn to actual shape of the Holding Pattern. Dashed line 0.60", 0.10" space.
Approach - ingress recovery track	. . . . .	Dots 0.035" diameter spaced 2 NM
Departure - egress track	— — — — — — — —	Dashes 0.15", spaces 0.10"

AERONAUTICAL OR TOPOGRAPHICAL MAP INFORMATION	SYMBOL OR MARK	DETAILED DESCRIPTION
MOCA lines		Dashed line, 0.20" dash, 0.10" space.
Prohibited, Restricted, Alert and Warning Areas		Areas drawn to scale using solid line perimeter.
Boundaries: ARTC Center		Dash 0.60", 0.10" space, 0.10" dash, 0.10" space, 0.60" dash, etc. letter "C" optional as required.
Sector Boundaries		Dash 0.60", 0.10" space, 0.10" dash, 0.10" space, 0.60" dash, etc. Letter "S" optional as required.
Special Operating Areas		Dash 0.15", 0.10" space, 0.10" dash, 0.10" space, 0.15" dash, etc. Letter "Z" optional as required.
ADIZ Area (Outline)		0.25" dash, 0.25" space, 0.25" dash, etc. Letter "A" optional as required.
Arrival and Departure Gates		Dashes 0.15"; spaces 0.10"
ATC Assigned Airspace Areas		Drawn to actual shape. Solid lines enclosing area or solid corners with opening at center parts of sides. Altitudes as required.
Positive Control		Limiting lines - 0.60" dash, 0.10" space Letter "P" optional as required.
Shoreline, River drainage as required		Solid line

FAA ATC RADAR VIDEO MAP PLATE ALIGNMENT MARKINGS

ALIGNMENT MARK AND FUNCTION	DEPICTION OF ALIGNMENT MARKS	DETAILED DESCRIPTION AND REMARKS
Range Arcs		RANGE ARCS (as required) each 3° long and centered on a radial (not to be shown) where minimum confliction with other video map plate information exists. Outer arc on this radial to be at maximum range (the inner circle). Intermediate arcs as required-number and position selected by Air Traffic Facility Chief. It is suggested that these intermediate arcs be made to coincide with the radar range marks, where practicable.
Range sweep alignment and linearity arcs and cardinal radials	**PLATE – Tube type mapper**  **SLIDE – Solid State mapper** 	Three CENTERING ARCS 3° long positioned 120° separation and located as required by maintenance. AZIMUTH RADIALS, magnetic and true, placed at four cardinal points extend from the outer to the inner circle. For TERMINALS the MAGNETIC azimuth and for ENROUTE the TRUE azimuth, are continued ½" toward the center. LINE WEIGHT for 8.5", 9.94" and 19" diameter plates is 0.003"±, for 2.3" and 3.0" slides 0.002"±. Outer circle the size of the video plate. Inner circle the maximum range of the radar or arcs each approximately 4° long centered on the four magnetic cardinal points at the maximum range of the radar (e.g.-40 NM for terminal area or 150 NM for enroute). Size of plates and slides vary in accordance with types of video mappers used. Size of notch vary in accordance with types of video mappers: 9.94" plate-3/16" square, 8.5" plate- ⅛" wide 5/16" deep. No notch required for 19.0" plates or 2.3" and 3.0" slides. Slides are aligned north to the center top side.

APPENDIX 2. REQUEST FOR AERONAUTICAL VIDEO MAP PLATE/SLIDE/OVERLAY, FAA FORM 7910-1

REQUEST FOR AERONAUTICAL VIDEO MAP PLATE/SLIDE/OVERLAY

TO (Contractor)

DATE REQUESTED | DATE PRODUCT REQUIRED

1 ELECTRONIC MAPPING EQUIPMENT

TYPE OF MAPPER	MAP PLATE/SLIDE SIZE (Circle)	QUANTITY PLATES/SLIDES REQUIRED
	2.3" 3.0" 8.5" 9.94" 19"	

MAP RANGE SIZE (NM)

ENROUTE 100 - 120 20 125 30 - 40 150 175 50 - 200 200 - 225 250 - -
TERMINAL 0 - 20

QUANTITY OF PHOTOPAPER COPIES

PLATE SIZE ____ COMPILATION SIZE ____ OTHER ____

2 VIDEO MAP OVERLAY

TYPE OF INDICATOR (FA-7300, FA-7700 etc.)	QUANTITY PER SYSTEM	MAP RANGES
		NM/ NM

3 RADAR EQUIPMENT

TYPE OF EQUIPMENT

ASR ____
ARSR ____

RANGE (NM RADIUS)

TERMINAL: 10 20 30 40 50 60

ENROUTE: 100 120 125 150 175 200 225 250

RADAR ANTENNA LOCATION

NAME

LATITUDE ° ' "

LONGITUDE ° ' "

NAME

LATITUDE ° ' "

LONGITUDE ° ' "

FROM: AAT FACILITY

MAILING ADDRESS

SUBMITTED BY: | DATE

TITLE | TELEPHONE

FAA Form 7910-1 (1-74) Supersedes all local forms

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4 **AIRPORTS**

PRIMARY AIRPORTS (TERMINAL) - List name, runway, length of extended centerline - if required.

NAME	RUNWAY	RWY ℄ NM	NAME	RUNWAY	RWY ℄ NM

5 **AIRPORTS**

SECONDARY AIRPORTS (TERMINAL/ENROUTE)
List name and indicate portrayal by distinctive runway pattern or symbol and approach bearing if applicable.

NAME	PATTERN	SYMBOL	BEARING	NAME	PATTERN	SYMBOL	BEARING

6 **CONTROLLED AIRWAYS/CORRIDORS**

Give ~~designation of each airway and or corridor~~:

7 NAVIGATIONAL AIDS

List name, ident and type (VOR, VORTAC, RBn etc.).
Use Controller Chart Supplement, Section 1 and 2 for positions when available or engineering survey or drawings.

NAME/IDENT	TYPE	LATITUDE ° ' "	LONGITUDE ° ' "

8 REPORTING POINTS

Use Controller Chart Supplement, Section 1 and 2 for positions.
If DME or off airway give facility, bearing and distance, and or radials that form the fix:

NAME/IDENT	LATITUDE ° ' "	LONGITUDE ° ' "	AIRWAY	(DME) FACS/BEARING/DIST.

9 HANDOFF POINTS/AREAS

Indicate point or area for change of control from one radar to another by geographical coordinates or DME, facility. bearing/distance and or radials.

10 OBSTRUCTIONS/PERMANENT ECHOES

List latitude and longitude or location description of each tower, water tank, building, mountain peak, bridge etc..

NAME	LATITUDE ° ′ ″	LONGITUDE ° ′ ″	NAME	LATITUDE ° ′ ″	LONGITUDE ° ′ ″

11 VISUAL CHECKPOINTS

Name/Describe points or features to be depicted and approximate latitude and longitude. If in congested area give detail description.

12 **ARTCC, SECTOR AND OTHER TYPE AREA BOUNDARIES**

List ARTCC boundaries; describe other area/boundaries making reference to known airways, reserved airspace, etc. or by geographical coordinates when available. Supplement with drawing.

13 **DESCENT AREAS**

Describe arrival and departure gates.

14 HOLDING PATTERNS

* Indicate Full or Reduction - FRONT END . FIXED END 2, 3, 4 etc.

ASSOCIATED FIX	DIR OF TURN	FAC./BEARING	TEMPLATE NO.	*REDUCTION

15 SPECIAL USE TRACKS

Indicate name/number. Describe track and indicate the portion to be shown. Include sketch.

16 TOPOGRAPHICAL/HYDROGRAPHIC FEATURES

Name features desired - rivers, shoreline, terrain, etc. and indicate limits to be shown.

17 SPECIAL USE AIRSPACE

Give designation, name or number, of each Restricted, Warning, Alert Areas, ISJTA's, ADIZ etc. as described in Airspace Docket.

18 MINIMUM VECTOR ALTITUDE

Describe areas/boundaries making reference to known airways, reserved airspace, etc. or by geographical coordinance, when available, and give altitude for each area.

19 ALIGNMENT/RANGE ARCS

Give magnetic azimuth/distance from radar site.